

CLAIMS

1 1. A polishing solution for metal, comprising an
2 oxidizing agent, an oxidized-metal dissolving agent, a
3 first protective-film forming agent, a second
4 protective-film forming agent different from the first
5 protective-film forming agent, and water.

1 2. The polishing solution for metal according to
2 claim 1, wherein said first protective-film forming agent
3 is at least one selected from a group of ammonia, amines,
4 amino acids, imines, azoles, mercaptans and saccharides.

1 3. The polishing solution for metal according to
2 claim 2, wherein said first protective-film forming agent
3 is at least one selected from among benzotriazole and a
4 derivative thereof.

1 4. The polishing solution for metal according to
2 claim 1, wherein said first protective-film forming agent
3 is a compound capable of forming a protective film by
4 forming physical adsorption and/or chemical linkage on

HC1467

5 the metal film surface.

1 5. The polishing solution for metal according to
2 claim 1, wherein said second protective-film forming
3 agent is compounds having an alcoholic or phenolic
4 hydroxyl group, esters, ethers, polysaccharides, amino
5 acid salts, polycarboxylic acids, polycarboxylates,
6 vinyl polymers, amides, azo compounds and molybdenum
7 compounds.

1 6. The polishing solution for metal according to
2 claim 5, wherein said second protective-film forming
3 agent is at least one selected from a group of polyacrylic
4 acids, polymethacrylic acids, polyamic acids, ammonium
5 polyacrylates, ammonium polymethacrylates, ammonium
6 polyamides and polyacrylamides.

1 7. The polishing solution for metal according to
2 claim 1, wherein said second protective-film forming
3 agent is a compound which assists the first
4 protective-film forming agent in forming a protective
5 film.

1 8. The polishing solution for metal according to

096394-06404
F01F90-16394650

HC1467

2 claim 1, wherein said oxidizing agent is at least one
3 selected from a group of hydrogen peroxide, nitric acid,
4 potassium periodate, hypochlorous acid and ozone water.

1 9. The polishing solution for metal according to
2 claim 1, wherein said oxidized-metal dissolving agent is
3 at least one selected from a group of an organic acid,
4 an ammonium salt of an organic acid, and sulfuric acid.

1 10. The polishing solution for metal according to
2 claim 9, wherein said oxidized-metal dissolving agent is
3 at least one selected from a group of malic acid, tartaric
4 acid, citric acid, ammonium malate, ammonium tartarate
5 and ammonium citrate.

1 11. A polishing solution for metal, having a
2 chemical mechanical polishing rate of 100 nm/minute or
3 higher and an etching rate of 10 nm/minute or lower.

1 12. The polishing solution for metal according to
2 claim 11, wherein said etching rate is 1 nm/minute or
3 lower.

1 13. The polishing solution for metal according to

HC1467

2 claim 11, wherein said chemical mechanical polishing rate
3 is 250 nm/minute or higher.

1 14. The polishing solution for metal according to
2 ~~any one of claims 11 to 13~~, which comprises an oxidizing
3 agent, an oxidized-metal dissolving agent, a first
4 protective-film forming agent, a second protective-film
5 forming agent different from the first protective-film
6 forming agent, and water.

1 15. A polishing solution for metal, comprising:
2 a first protective-film forming agent which is a
3 compound capable of forming a protective film by forming
4 physical adsorption and/or chemical linkage on the metal
5 film surface; and
6 a second protective-film forming agent which is a
7 compound which assists the first protective-film forming
8 agent in forming a protective film.

1 16. The polishing solution for metal according to
2 claim 1, ~~11 or 15~~, which is used to polish a metal
3 containing at least any one of copper, a copper alloy,
4 a copper oxide and a copper alloy oxide.

HC1467

1 17. The polishing solution for metal according to
2 claim 1, ~~11 or 13~~, which substantially does not contain
3 any abrasive grains.

1 18. The polishing solution for metal according to
2 claim 1, wherein said second protective-film forming
3 agent is a compound which enables the first
4 protective-film forming agent to be added in a smaller
5 quantity; the first protective-film forming agent being
6 necessary for controlling etching rate to 10 nm/minute
7 or lower.

1 19. A polishing method comprising polishing a metal
2 film formed on the surface of a polishing object, in the
3 polishing solution for metal according to claim 1, ~~11 or~~
4 ~~15~~ to remove the metal film.

1 20. The polishing method according to claim 19,
2 wherein said metal film contains at least any one of
3 copper, a copper alloy, a copper oxide and a copper alloy
4 oxide.

1 21. The polishing method according to claim 19,
2 wherein;

HC1467

3 said polishing object has a multi-layer film having
4 a metal layer containing at least any one of copper, a
5 copper alloy, a copper oxide and a copper alloy oxide;
6 said polishing method being a method of removing at
7 least part of the metal film from the multi-layer film.

1 22. The polishing method according to claim 19,
2 wherein said polishing solution for metal substantially
3 does not contain any abrasive grains.

09753894-064401
TOTTENHAM T6889260